

THIS ANNUAL SUMMARY .

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PLANT PEST CONTROL DIVISION  
COOPERATIVE FOREST PEST ACTION PROGRAM

1976 ANNUAL SUMMARY

GENERAL COMMENTS

January 1976 had the same unseasonably warm weather as has been experienced the last 5 or 6 years. Therefore, we had some abnormal conditions to report in the early part of the year. The January hatching of the Virginia Pine Sawfly, Neodiprion pratti pratti, has caused the populations to be extremely low and it is difficult to find specimens in southern West Virginia.

The Pest Identification Laboratory logged in and answered 637 insect and disease problems in 1976. A total of 399 of these specimens were received during May 1 through September 1, 1976. A total of 584 telephone calls requesting assistance or information were received during 1976.

Spring defoliators were predicted to cause no damage and observations have since shown this to be true.

The Oak Sawfly, both an early summer and late summer defoliator, caused approximately 100,000 acres of oaks to be defoliated in southern West Virginia. The Asiatic Oak Weevil caused approximately 1,500 acres of oaks to be defoliated in late July in Pocahontas County.

The Plant Pest Control Division, West Virginia Department of Agriculture, in cooperation with Thompson-Hayward Chemical Company, sprayed 75 trees with Dimilin using back pack sprayers. This was an experimental spray to measure the efficacy of Dimilin on the Oak Sawfly. Results of this test are in this newsletter.

FOREST INSECTS

Oak leaftier - Croesia albicomana - In January 1976 an egg survey was conducted in the Elkins, Moorefield, Franklin, Greenbank, Marlinton, and Alvon areas to predict the 1976 defoliation by this insect and to see if the insect had spread from the areas previously infested.

A total of twenty plots were checked and it was found the area around Frank, Boyer, Cass and Seneca State Forest would have moderate defoliation (26-75% defoliation) to approximately 30,000 acres of oaks. An

additional 100,000 acres of oak would have negligible to light infestations. No eggs were found in the Elkins, Franklin and Moorefield areas.

Ground scouting during May-June of 1976 showed the insect to cause damage as predicted.

The egg survey has been completed for 1977 and the results are the same as 1976 except one egg was found in the Franklin area. This means the insect is probably spreading from the previously infested areas.

The Gypsy Moth - Porthetria dispar or Lymantria dispar. The Gypsy moth continues to move south and west. In the northeast, gypsy moths defoliated 866,926 acres in seven states. In 1975 the insects defoliated 464,451 acres in seven states.

Many times when a figure is given on defoliation, the first question is: Was this complete defoliation? The answer to this is: No, this is a total of all classes of defoliation. Below is a list of the states experiencing defoliation in 1976 and the percentages of each.

#### 1976 DEFOLIATION BY GYPSY MOTH

All Figures are Acres.

	LIGHT up to 30%	MODERATE 31 - 60%	SEVERE 61-100%	TOTAL 1976	TOTAL 1975
Maine	0	0	0	0	0
New Hampshire	0	0	0	0	0
Vermont	500	710	2,024	3,234	15
Massachusetts	5,720	9,000	15,000	29,820	17,895
Rhode Island	7,540	0	0	7,540	435
Connecticut	312	9,263	234	9,809	63,411
New York	19,312	2,618	4,653	26,583	9,275
Pennsylvania	2*	488,210	244,100	732,310	317,880
New Jersey	2,915	8,865	45,850	57,630	55,430
TOTAL	36,299	518,666	311,961	866,926	464,451

Also, listed below are figures for defoliation by year (in acres).

1964 - 254,983	1969 - 255,829	1974 - 750,905
1965 - 263,201	1970 - 972,833	1975 - 464,451
1966 - 51,865	1971 - 1,945,224	1976 - 866,926
1967 - 52,373	1972 - 1,369,130	
1968 - 80,123	1973 - 1,773,846	

2\* - Not recorded.

Current policy for Cooperative State/Forest Service gypsy moth suppression projects is to treat only high value, high use recreational areas, forested communities and high value woodlands in which gypsy moth populations are at damaging levels and show no indication of suppression by natural factors. Spraying alone will not stop an outbreak but it will reduce pest populations so that damage is minimal. For this reason, many areas harboring light to moderate gypsy moth populations are not treated with insecticides, but left for control by natural agents.

Approximately 4,000 traps were placed in West Virginia this year. Jefferson and Berkeley counties were trapped on a grid system using 4 traps per square mile. The other eastern panhandle counties were trapped on a 1 trap per 3 square mile grid and a 1 trap per 9 square mile grid. Additionally, the state parks, state forests, public hunting and fishing areas, Corp of Engineers land and 15 western counties were trapped. The counties bordering Virginia in Southeast were on a 1 trap per 9 mile square area.

The trapping program this year gave a recovery of 10 male moths in 9 traps. Three male moths in 3 traps were recovered in Berkeley County. Seven male moths in 6 traps were recovered in Jefferson County. The multiple male catch was at Wilson Gap Shelter on the Appalachian Trail. An additional catch was found approximately 2½ miles north of this catch on the Appalachian Trail and 3 male moths were caught ½ mile west of these sites on the Blue Ridge Mountain slopes. It is interesting to note that these six male moths were all caught in an area 2½ miles long and ½ mile wide.

Aerial surveys of these areas will be conducted in mid and late June to pinpoint any defoliation that may occur from a possible gypsy moth infest.

In 1976 field tests were conducted in Pennsylvania on the use of Dimilin (Thompson-Hayward Experimental 6040) and/or therefore suppressing the gypsy moth. Excellent foliage protection and larval reduction was achieved. See table below.

TREATMENT	RATE lb/active ingredient	TIMING 1*	PERCENT Final Defoliation	PERCENT Larval Reduction
Dimilin 25 wp	.01	Early	30	90
Dimilin 25 wp	.01	Standard	30	98
Dimilin - Oil	.06	Standard	30	100
Control			100	0
Orthene 75s	.38	Standard	30	91
Orthene 75s	.50	Early	20	99
Orthene 75s	.50	Standard	20	75
Orthene 75s	.50	Late	30	88

1\* Application timing early 1st - 2nd stage larvae. Standard 2nd - 3rd stage larvae. Late 3rd - 4th stage larvae.

For more than a decade Carbaryl (Sevin) has been the principal insecticide used for control of gypsy moth. A new pesticide, Dimilin, is effective against gypsy moth larvae in the laboratory, in field tests and in small scale operational use. Dimilin does not act like conventional pesticides in causing larval mortality. It is commonly referred to as an insect growth regulator. It inhibits the formation of Chitin adversely effecting the moulting process of the caterpillars. Unable to complete moulting between instars the caterpillars die.

Dimilin and Carbaryl will be used in suppression projects during 1977.

Burlap bands will continue in the male moth catch sites. These bands are checked throughout the season for larvae, pupae, eggs, and other insects that normally occur in each area.



SUMMARY OF 1976  
GYPSY MOTH  
BIOLOGICAL CONTROL PROGRAM ACTIVITIES  
IN WEST VIRGINIA

Charles C. Coffman, Entomologist and Project Leader

PARASITE REARING

After three years and five months of continuous operation, the gypsy moth parasite rearing program was terminated indefinitely due to loss of lab space to our leasor, Union Carbide. The total number of Brachymeria intermedia reared and released over the 41 month period was 392,150 and 213,780, respectively.

Disregarding our loss of space to Carbide, the apparent failure of B. intermedia to establish on alternate native hosts over the three season release period was reason enough to consider discontinuing the program. I say apparent failure because I'm not sure the techniques we've been using and the amount of effort expended justifies a no-establishment conclusion.

OTHER REARING

Prior to closing the rearing facilities, two exercises were conducted primarily for the experience provided to lab personnel.

Two whitemarked tussock moth (Hemerocampa leucostigma (J. E. Smith)) egg masses were collected in early March in Jefferson County and brought to the lab. Emerging larvae were fed several different diets. The only diet readily accepted, and on which they were subsequently reared, was the gypsy moth diet<sup>1</sup> from Bio-Serv, Inc., Frenchtown, New Jersey. Procedures used to rear the larvae were the same as those used by the New Jersey Department of Agriculture for rearing gypsy moth larvae. Viable eggs were obtained from ensuing adults and the second generation was being maintained when rearing facilities were closed down. Thoughts of using caged pupae of H. leucostigma as field bait for Brachymeria intermedia release evaluation were never put into action, as not enough pupae were obtained from the first generation. Brachymeria intermedia was reared successfully on H. leucostigma pupae in the lab.

<sup>1</sup> Mention of a proprietary product does not constitute an endorsement by the West Virginia Department of Agriculture

An egg mass collected at the same time as those above turned out to be that of the wheel bug Arilus cristatus (L.)). Emerging nymphs were placed in 16 oz Dixie<sup>®</sup> cups and fed coddled, early-to-middle instar greater wax moth (Galleria mellonella (L.)) larvae. Third instar nymphs were transferred to one-gallon, wide-mouthed glass jars with screened lids and fed coddled, late instar larvae. Fresh larvae were placed in the rearing containers and those that had been fed upon were removed daily. Reared in this manner, there were seven nymphal instars with each lasting about one week. Approximately 120 nymphs were reared to adults and released.

#### PARASITE RELEASES

Eight species of polyphagous parasites were released in 1976. Included were: the early instar larval parasites Apanteles liparidis, A. porthetriae, and Meteorus pulchricornis; the late instar larval parasites Blondelia nigripes and Palexorista inconspicua, and the pupal parasites Brachymeria intermedia, Coccygominus instigator, and C. turionellae moraguesi. Potential alternate hosts known to be present in most release areas, and not listed in previous summaries, include: forest tent caterpillar, Malacosoma disstria (Hubner); the pale tussock moth, Halisidota tessellaris (J. E. Smith); and several species of "underwing moths", Catocala spp.

All 1976 parasite releases are summarized in Table 1. Releases over the entire period of our involvement are summarized in Tables 2 and 3. Minor discrepancies between release figures printed here and those reported in previous summaries are the result of rounding those in this report for standardization to even units (tens). Detailed release and site information is available on request.

#### PARASITE EVALUATION

For the first time since this program was initiated, field activities took precedence over insect rearing. This began with an increase in Malaise trap construction activities early in the year. Ten traps were completed. The primary component in nine of these was olive-drab, nylon mosquito netting purchased from an army surplus outlet. Forest green fiberglass screening, purchased from Phifer Wire Products, Inc., Tuscaloosa, Alabama, was used in the other trap to test this material's suitability. Based on informal observations, the fiberglass was superior to the nylon for use as trap netting. The only disadvantages of the fiberglass were weight and price, but these were more than offset by its durability.

Unsatisfied with the cost and/or design of available Malaise trap collecting devices, a new device was fabricated and tested. It was inex-

pensive, easy to construct, adaptable to more than one trap netting design, and proved to be highly effective. A manuscript on construction and use of the device is being prepared for review for publication.

Pursuing the Malaise trap concept further, six smaller traps were constructed from the fiberglass screening and adapted for aerial use to sample vertically above the forest floor. Due to the late completion date, these traps did not get tested, but will be used during the 1977 season.

Nine study sites were selected in five counties including three Brachymeria intermedia release sites retained from last year for continued monitoring. Criteria on which sites were selected included: (1) a high percentage and variety of oaks present, (2) a relatively open canopy with good light penetration, and/or (3) the presence of extensive forest and field border areas, i.e. "edge". These criteria were tailored primarily for B. intermedia. An attempt was made to keep the study areas similar in size, but not in shape, since some variation in shape was dictated by site characteristics and was considered desirable. All plots were approximately 0.2 ha (0.5 acre) with one exception and it was about 0.4 ha (1 acre). Thirty trees (primarily oaks) were systematically selected for burlap banding within each area and one Malaise trap was placed in each.

The objectives of the burlap bands were to determine what species of Lepidoptera were feeding on oaks that might serve as hosts for released parasites and to monitor their populations over an entire season. Malaise trap objectives were to monitor for released parasites, survey for native parasitic species, and monitor the latter's seasonal population fluctuations. Observations and collections were made weekly in each study area between May 18th and August 25th and were extended on a bi-weekly basis to October 28th in four of the areas.

As expected, we were virtually inundated with specimens from the Malaise traps. Approximately 159,000 were collected and sorted into major Orders. A breakdown of these is given in Table 4. The Coleoptera, Dipter, and Hymenoptera have undergone more detailed sorting and a currently unknown, but large, number have been pinned or otherwise prepared for identification. Even with the help from the United States National Museum and selected taxonomic specialists, identification of even the most important specimens will require considerable time.

A total of 12,987 observations of larvae and known pupae were made on the 270 burlap banded trees. Percent composition of tree species banded was as follows: white oak 35.9, red oak 18.9, black oak 17.4, scarlet oak 13.0, chestnut oak 11.5, hickory 3.0, and post oak 0.4. The climbing cutworm, Polia latex (Guen.), accounted for 87.9% (11,422) of the above observations; while Dasychira spp. (340), Halisidota spp. (297), and Hypoprepia spp. (389), accounted for another 7.9%. The remaining 4.2% was comprised of many miscellaneous species. Complete identification will be obtained on as many of these as possible.



TABLE 1 - 1976 GYPSY MOTH PARASITE RELEASES<sup>1</sup> IN WEST VIRGINIA

COUNTY	SPECIES							
	<u>Apanteles</u> <u>liparidis</u>	<u>Apanteles</u> <u>porthetriae</u>	<u>Meteorus</u> <u>pulchricornis</u>	<u>Blondelia</u> <u>nigripes</u>	<u>Palexorista</u> <u>inconspicua</u>	<u>Brachymeria</u> <u>intermedia</u>	<u>Coccygomimus</u> <u>instigator</u>	<u>Coccygomimus</u> <u>turionellae</u> <u>moraguesi</u>
Hampshire	1,750	1,030	360	780	2,350	5,500	90	490
Hardy		60	100	370	1,320	3,000		
Kanawha						1,290		
Mineral						1,000		
Pocahontas				340	1,010	500		
TOTAL	1,750	1,090	460	1,490	4,680	11,290	90	490

<sup>1</sup> Rounded to nearest ten.

TABLE 2. - 1973-76 BRACHYMERIA INTERMEDIA RELEASES<sup>1</sup> IN WEST VIRGINIA

COUNTY	YEAR				
	1973	1974	1975	1976	TOTAL
Berkeley	7,000		2,000		9,000
Boone		300			300
Grant	3,000	2,750	3,000		8,750
Greenbrier		14,530			14,530
Hampshire	1,000	10,000	70,000	5,500	86,500
Hardy	1,000		33,000	3,000	37,000
Jefferson	4,000		2,000		6,000
Kanawha	250		330	1,290	1,870
Mineral				1,000	1,000
Pendleton	1,000		19,100		20,100
Pocahontas	5,830	10,000	6,000	500	22,330
Randolph		400			400
Tucker		6,000			6,000
TOTAL	23,080	43,980	135,430	11,290	213,780

<sup>1</sup> Rounded to nearest ten.

TABLE 3. - 1974-76 GYPSY MOTH PARASITE<sup>1</sup> RELEASES<sup>2</sup> IN WEST VIRGINIA

SPECIES	COUNTY										TOTAL
	<u>BOONE</u>	<u>GRANT</u>	<u>GREENBRIER</u>	<u>KANAWHA</u>	<u>HAMPSHIRE</u>			<u>HARDY</u>		<u>POCAHONTAS</u>	
	1974	1974	1974	1975	1974	1975	1976	1975	1976	1976	
<u>Apanteles</u> <u>liparidis</u>						1,140	1,750	1,000			3,890
<u>Apanteles</u> <u>porthetriae</u>						250	1,030	500	60		1,840
<u>Meteorus</u> <u>pulchricornis</u>		200				390	360	220	100		1,270
<u>Blondelia</u> <u>nigripes</u>							780		370	340	1,490
<u>Palexorista</u> <u>inconspicua</u>						370	2,350	380	1,320	1,010	5,430
<u>Coccygomimus</u> <u>instigator</u>						110	90				200
<u>Coccygomimus</u> <u>sp.</u>	800		1,000	60	400	1,150		550			3,960
<u>Coccygomimus</u> <u>turionellae</u>						450		200			650
<u>Coccygomimus</u> <u>turionellae</u> <u>moraguesi</u>										490	490
TOTAL	800	200	1,000	60	400	3,860	6,360	2,850	1,850	1,840	19,220

<sup>1</sup> Excluding Brachymeria intermedia<sup>2</sup> Rounded to nearest ten.

Unknown Lepidoptera pupae that were collected from under burlap bands late in the season, and from which adults did not emerge, were prepared for overwintering in 16 oz. Dixie® cups filled with vermiculite and placed outside in cages. Identification of adults emerging from these pupae in the spring will aid in future field identifications of pupae.

Separate detailed reports will eventually be issued on both the Malaise trap collections and burlap band observations.

Traps baited with greater wax moth (Galleria mellonella) pupae were used to survey for Brachymeria intermedia at the Capon Bridge, Grace, and Romney sites, all in Hampshire County, and the Fort Seybert site in Pendleton County. The trapping period extended from June 15th to July 14th. This was the period considered optimum for recovery of first generation B. intermedia. Ten traps were scattered throughout each plot by hanging in trees from approximately four to seven feet off the ground. Each trap contained 10 to 15 pupae and was changed weekly. A total of 160 traps was used during the four-week period. No B. intermedia were recovered from this effort, but it was not a total loss. Nine native Brachymeria ovata (Say) were recovered from the Romney site and two from the Fort Seybert site. Also, a single B. ovata male was recovered from a total of 40 traps placed at my residence in Kanawha County (where small numbers of B. intermedia have been released) over the same period as the above traps. The pupa from which this male emerged was exposed from June 23rd through the 30th.

Recovery of Brachymeria intermedia from alternate host populations in West Virginia in the absence of its primary host Lymantria dispar (L.).

An adult male Brachymeria intermedia was recovered from an unknown pupa collected from a burlap band on white oak near Allensville, Berkeley County, West Virginia, by P. VanBuskirk on July 22, 1976. This is the first record of establishment of this species on an alternate host population. Establishment apparently occurred from releases made 2½ air miles away near Johnstown, Berkeley County (1972 Lymantria dispar male moth catch site) on May 17, 1973 (1,000 individuals) and/or June 21, 1973 (1,000 individuals).

In addition to this recovery, another adult male has been identified (not yet confirmed), was recovered from a pupa believed to be Bomolocha baltimoralis Guenee (Noctuidae: Hypeninae). This pupa was collected by B. Northeimer from a burlap band on white oak at the Fort Run site in Hardy County on August 10, 1976. The last release of B. intermedia at this site was September 11, 1975 (7,000 individuals) so overwintering and subsequent ovipositing did occur. This site was also a 1972 male gypsy moth trap catch site and releases of B. intermedia there go back to May 16, 1973.

An intensive effort will be made during the coming season to solidify these observations with additional recoveries and by pinpointing the hosts.

In continuing effort to monitor oak leaftier (Croesia albicomana (Clemens)) pupal parasitism in an area where large numbers of B. intermedia have been released, over 300 pupae were collected on June 25th near Frank,



Pocahontas County. Results of this collection are given in Table 5. Of the parasites recovered, all were hymenopterans with the exception of one dipteran species. Specific identifications have not been completed. Comparing these results with those from last year for the same location, successful parasitism increased by 9.4%, mortality accounted for by parasitism by 13.5%, and pupal mortality by 5.4%. How significant these increases are in relation to oak leaftier population density at this location is uncertain. Leaftier egg counts from the area will be examined later for comparison with parasitism figures.

TABLE 5. Oak leaftier (*Croesia albicomana* (Clemens)) pupal parasite collection, Frank, Pocahontas County, June 25, 1976.

	SITE #1	SITE #2	SITE #3	TOTAL
# Pupae	107	107	113	327
# Parasites emerged	20	20	12	52
% Successful parasitism	18.7	18.7	10.6	15.9
# Pupae - No emergence	27	11	15	53
# Unemerged parasites in latter	14	4	3	21
% Mortality accounted for by parasitism	31.8	22.4	13.3	22.3
Total pupal mortality	47	31	27	105
% Pupal mortality	43.9	29.0	23.9	32.1

A new and more justified objective of this program that emerged this past season is an attempt to document the occurrence and abundance of defoliating Lepidoptera on the major oak species in the state, since gypsy moth prefers oaks and it is with these species that we stand to sustain the greatest economic losses. Pursuing this objective will furnish us information on the normal feeding pressure sustained by oaks and on which species of defoliators that may become more important to oak mortality through defoliation of reforesting trees previously subjected to gypsy moth attack.

Looking ahead to the 1977 field season, the oak defoliator survey work will be conducted simultaneously with the Malaise trapping program, as was done last year. The latter will concentrate on use of aerial traps to sample different heights beneath and near the edge of the forest canopy. Observations and collections will again be made weekly. Our weakest point will continue to be the lack of a full time taxonomist to handle the volume of identification work required to support our field programs.

Fall cankerworm - Alsophila pometaria. As predicted there was no noticeable defoliation by the cankerworm in the Dolly Sods, Mount Storm or Blue Ridge Mountain areas during 1976. The insect populations collapsed due to parasitism of the eggs and predation by Calosoma frigidum.

Tangle foot barriers to trap adult female moths and egg sampling in the affected areas are continuing and the results for the 1977 season are as follows: the average number of females per tree in the Dolly Sods area was 5.2 and 8.2. The Mt. Storm area had an average of 18.25 and 12.8 females per tree. The egg sampling showed in the Dolly Sods area there would be moderate defoliation to oaks and maples on approximately 100 acres. The Mt. Storm area egg counts were very small and occasional trees may be defoliated. The Dolly Sods area plots yielded: Plot #1, 18 eggs/15, 30" branch samples; Plot #2, 5 eggs/10 30" branch samples; Plot #3, 2 eggs/10 30" branch samples, Plot #4, 0 eggs/10 30" branch.

The eggs were brought to the laboratory and allowed to hatch. The results are not complete but preliminary findings show the eggs are heavily parasitized.

The prediction for defoliation during 1977 will be limited to small areas and occasional trees will be moderately defoliated 20-30%.

Aerial flights and ground surveys will be conducted in June to see if these predictions hold true and if the insect has spread to additional areas.

Growth loss studies will be conducted in the cankerworm areas this year.

Walking stick - Diapheromera femorata. An outbreak of this insect occurred in 1973 in Mineral County and it continues to be a problem in isolated areas. Approximately 100 acres of Black locust and oaks were defoliated this year in Mineral County. As stated in past records, this insect has one generation every year rather than one generation every two years. This insect seems to be increasing throughout the state and defoliation may be heavy in many areas.

Southern pine beetle - Dendroctonus frontalis. Occasional specimens were submitted during 1976 and infestations have been noted. However, populations of this insect collapsed throughout the south in 1975 and 1976 and in many areas it is hard to find any specimens. Many study plots on pine plantations in the south have been discontinued for this reason.

Locust leaf miner - Odontota dorsalis. This insect caused heavy damage to black locust throughout West Virginia with the exception of the Allegheny Mountain region. It is expected the insect will cause extensive damage to black locust in West Virginia during 1977.

TABLE 4. - Specimens collected from nine Malaise traps in the Northeastern West Virginia in 1976:  
comparison of percentage composition by major Orders.

SITE	ORDER					N	Collection Dates
	Diptera	Hymenoptera	Coleoptera	Lepidoptera	Other <sup>1</sup>		
Capon Bridge, Hampshire Co.	28.7%	13.1%	5.0%	5.0%	48.2%	15,997	8 June - 28 Oct.
Grace, Hampshire Co.	33.0	20.5	4.8	5.5	36.2	38,553	25 May - 28 Oct.
Romney, Hampshire Co.	36.7	19.2	10.4	4.5	29.1	22,309	25 May - 28 Oct.
Fisher, Hardy Co.	27.6	14.1	7.6	6.1	44.6	18,000	26 May - 27 Oct.
Fort Run, Hardy Co.	25.1	12.1	3.5	5.5	53.8	32,642	26 May - 24 Aug.
Old Fields, Hardy Co.	26.5	18.5	12.5	9.1	33.4	4,709	6 July - 24 Aug.
Junction, Mineral Co.	23.1	25.4	14.3	8.3	28.9	8,043	26 May - 24 Aug.
Fort Seybert, Pendleton Co.	33.4	24.6	12.3	9.9	19.8	6,060	8 July - 26 Aug.
Boyer, Pocahontas Co.	40.3	19.0	4.5	6.5	29.7	13,318	17 June - 26 Aug.

<sup>1</sup>The majority of specimens in this category are minute Diptera that were not removed in the initial sorting.

Fall webworm - Hyphantria cunea. The webworm was generally found in most counties of the state, but caused little or no damage in most instances. The insect did, however, cause complete defoliation to hardwoods in Mineral, Greenbrier, Hampshire, Preston, Tucker and Grant counties. For 1977 the insect will probably infest the same areas and spread to adjacent areas. This insect is very unpredictable and a collapse may occur this year.

Eastern tent caterpillar - Malacosoma americanum. Very few nests were observed in West Virginia during 1976 and no heavy populations are expected for the next few years. This insect is at an all time low in West Virginia, however, it has been observed that populations are starting to build up in the Huntington area.

Forest tent caterpillar - Malacosoma disstria. No specimens were submitted to the pest identification laboratory this year and very few larvae were seen in the field. No outbreaks are expected in 1977.

Virginia pine sawfly - Neodiprion pratti pratti. Populations of this insect are at an all time low in West Virginia. Occasional specimens were noted in central West Virginia.

A leaf mining weevil - Odontopus calceatus. This insect was abundant in localized areas and caused moderate damage to leaves of yellow poplar and magnolia as ornamentals.

The pine leaf chermid - Pineus pinifoliae. The pine leaf chermid caused moderate damage to red spruce in the mountainous areas of West Virginia. Damage to white pine, the alternate host, was minimal.

The periodical cicada - Magicicada septendecim. Brook I of the periodical cicada or seventeen-year locust will occur in 1978 in Grant and Pendleton counties.

An oak sawfly - Caliroa quercuscoccineae. This insect caused complete defoliation to 100,000 acres of oaks in southern West Virginia. The defoliation generally extended from Alderson in Greenbrier County to the Virginia line in McDowell County. Specimens of the insect have been submitted from Berkeley, Monroe, and Roane counties.

Plans are underway to treat 500-600 acres of oak with Dimilin (TH 6040) by helicopter to determine the efficacy of Dimilin on the oak sawfly.



## OAK SAWFLY STUDY AT PIPESTEM STATE PARK

The oak sawfly Caliroa quercusoccineae has caused complete defoliation to approximately 100,000 acres of oak forest land in southern West Virginia the last few years (1974-76).

So far the insect has not caused any mortality, mainly because the insect attacks oak trees in July and again in late August. The real or main problem is aesthetics in the areas affected. For example, Pipestem State Park had approximately 2,000 acres defoliated at a time when the park is crowded with visitors. Needless to say, the visitors see the damage and would like to know if it will continue and perhaps next year they will visit another area for vacation or relaxation.

The Superintendent at Pipestem contacted us to see if a spray could be conducted to control this insect. After much investigation into the life history of this insect it was found there was no such information available.

In June 1975, J. Douglas Hacker and Alan R. Miller started work to find out the life history of the insect. It was found that the first generation of larvae feed from the last of June until the first of August. Defoliation starts in the top of the tree and works downward. The first generation adults are found from mid-August until the last of August. Eggs are laid in slits on the top surface of the leaves and hatch in a few days. The second generation of larvae start feeding the first of September and continue until the first of October, at which time they enter the soil and overwinter as prepupae.

Due to the difficulties encountered in conducting a spray program by helicopter, it was decided to spray an experimental chemical, Dimilin (TH 6040) with back-pack sprayers on selected oak trees in the park system.

On July 7, seventy red, and pin oak trees were sprayed with Dimilin at the rate of 1 pound of 25% Dimilin WP to 50 gallons of water. This gives us an active ingredient of 0.6% Dimilin. Each tree was sprayed with an average of .71 gallons of the mixture.

An average egg and larval count was made on the trees to be sprayed. Not all trees were sampled but eggs and larvae were abundant on all sprayed and unsprayed trees. Branch samples were 36 inches long and no attempt was made to count the total number of leaves on a branch sample. However, a count was made on some trees with leaves having eggs present.

On June 10, 1976, a 36" branch sample was taken from a red oak. The number of eggs on that branch was counted. The average was 52.7 eggs per leaf on seven leaves, or a total of 369 eggs per 36" branch sample.

On June 24, 1976, three more red oak trees were sampled and the counts were: (1) 140.5 eggs/leaf on 6 leaves or 846 eggs per 36" branch sample; (2) 346 eggs/leaf on 4 leaves or 1347 eggs per 36" branch sample;

(3) 192 eggs/leaf on 11 leaves or 2116 eggs per 36" branch sample.

On June 29, 1976, larval counts were made on three 36" branch samples taken from three separate trees. The counts were 643, 435, and 21 larvae per 36" branch sample. During the time of this checking or counting larvae, it was noted that eggs were still hatching. There were first, second, and third instar larvae present on the leaves. Many white oak trees were checked, but no eggs were found. Apparently the insects lay their eggs only on the red oak group of trees. However, feeding by larvae has been noted on the white oaks, especially in the second generation.

After the spray was completed the trees were checked to see if the chemical had had any effect, and, if so, to what degree.

On July 13, 1976, the sprayed trees were checked and 36" branch samples were made on selected trees at random. Only three trees out of 70 trees sprayed had any live larvae. The other 67 trees had no live larvae and no additional damage was noted. There was some damage noticed on all trees, about 2 to 5%. Larvae had started to feed at the time of spray.

<u>SAMPLE TREES 36"</u>	<u>LIVE LARVAE</u>	<u>DEAD LARVAE</u>	<u>COMMENTS</u>
No. 2	1	18	No additional damage
No. 6 Top of tree not sprayed Too high for back-pack sprayer	34	0	No additional damage
No. 6-3/4 of tree sprayed	6	9	No additional damage
No. 9	11	4	No additional damage
No. 14	0	30	No additional damage
No. 18	0	14	No additional damage
No. 31	0	72	No additional damage
Unsprayed tree at Lodge	76		Tree 50% defoliated

#### August 3, 1976

Visited area and found all first generation larvae were dead. However, new eggs were found on branch for the second generation. No new or additional damage was noted. The unsprayed trees have 50% to 80% defoliation and larvae found were in fifth instar.

#### August 20, 1976

The New or Second generation eggs had just hatched.

<u>TREE</u>	<u>EGGS/36"</u>	<u>LIVE</u>	<u>DEAD</u>	<u>COMMENTS</u>
No. 2	460	240	15	Just hatched and new eggs
No. 4	No count	50	5	First instar
No. 6	278	0	0	Just hatched
No. 15		83	5	Just hatched - seem to die upon hatching
No. 17			17 dead	Anisota larva
No. 18-22	All larvae dead, no counts made			
No. 39	230			New eggs
No. 43		65	16	First instar
Unsprayed	315			Larvae just hatching

#### September 9, 1976

New eggs are evident on leaves and all newly hatched larvae are dead. A few second and third instar larvae were found and appeared very sick. One branch sampled had 43 dead larvae and no live larvae were found.

#### September 13, 1976

Could not find any live larvae on trees except trees No. 14 thru 17. On the previous visit leaves were marked on trees No. 42 and 43 for counts when the larvae hatched. The leaf on No. 42 had 5 live first instar larvae and one fifth instar larvae. However, there were 101 dead first instar larvae. Tree No. 43 had 10 first instar larvae alive and 109 first instar larvae dead.

#### September 28, 1976

This was the last trip made to the area and only occasional larvae could be found on sprayed and unsprayed trees.

From the observations and information gathered it was evident that the chemical Dimilin was effective until September 24, at which time most of the insects were tapering off. Also, it was very evident those trees sprayed with Dimilin were protected and other trees in close proximity were completely defoliated by the second generation. During the July 7th spray we also sprayed 4 trees with Methoxychlor and this chemical apparently lasted only about 25 days because the second generation completely defoliated these 4 trees which were healthy through the first generation. It is my opinion that Dimilin could be applied in late June or the first of July to provide complete protection through the two generations of the sawfly.

Bagworm - Thryidopteryx ephemeraformis. Many ornamental shrubs, evergreens, and hardwoods were completely defoliated throughout the state. The bagworm seems to be increasing and considerable defoliation may be expected before the insect subsides due to natural factors.

The following is a list of insects that were sent or reported to the Pest Identification Laboratory. Many specimens submitted are not listed because they are not economically important or are of little economic concern.

#### BARK BEETLES AND WEEVILS

The engraver beetles Ips, Scolytus and Dendroctonus were not abundant this year as in the past.

Ips sp. caused moderate damage to scotch pine in Wetzel County. Ips grandicollis found causing light damage to Virginia pine in Putnam County. The black and red turpentine beetles caused death to approximately 1 acre of Ten Acre Plantation of 30 year old Scotch pine in Fayette County. The Hickory Engraver beetle Scolytus quadrispinosus caused death of many hickory trees throughout the Kanawha Valley. All of the areas experiencing damage were either new housing areas where soil had been disturbed or occupants had used Scotts Turf Building Plus 2. This turf builder contains 2, 4-D, and must be used with caution around trees, shrubs and other broad leaved plants.

A weevil, Hylobius sp., caused moderate damage to 1 acre of Scotch pine in Mineral County. The white pine weevil, Pissodes strobi, submitted from Summers County where light damage was noticed on white pine.

#### SCALE INSECTS

Scale insects are one of the more common insects encountered on ornamental shrubs, house plants, and forest trees. Injury is normally caused by the withdrawal of plant juices from the host by large number of insects. Some of the scale insects submitted to the lab were: San Jose scale on Forsythia, Kanawha County; Terrapin scale on Maple, Cabell County; Oyster shell scale on Lilac, Kanawha County; Euonymus scale on Euonymus, Kanawha County; Magnolia scale submitted from Kanawha, Cabell, and Wetzel counties; the Scurfy scale found on Yellow poplar and fruit trees. This scale was the most common specimen submitted. Cottony maple scale on maple; the Obscure scale found infesting 20 fruit trees in nursery at Marshall County.

#### APHIDS

Aphids, like scale insects, cause injury to the host by withdrawing juices from the host plant. The number of aphid specimens submitted to the lab exceeded that of any other insect group. Listed are some of the more common. Pine bark aphid; aphids on elm, apple and oak. Wooly alder aphid on Alder, Putnam County; numerous specimens of the Eastern spruce gall aphid were submitted.



## GALL INSECTS

Gall insects are found on practically every type of plant we encounter. The galls are unsightly and many times cause trees to be off-color or sickly. The galls seldom, if ever, cause death of trees. Climatic conditions seem to determine the insects abundance or absence on plants. The following is a partial list of specimens that were submitted: the Gouty oak gall on oak in Kanawha and Greenbrier counties; numerous specimens of the maple bladder gall and the maple spindle gall were received; the solitary oak gall on oak in Kanawha County; the hickory gall midge; mid-rib gall of yellow poplar; oak petiole gall; the hickory gall aphid; azalea gall; beaked willow gall.

## SAWFLIES

A sawfly, Macremphytus tarsatus, found causing damage to dogwood in Kanawha County.

The red-headed pine sawfly, Neodiprion lecontei, caused damage to Scotch pine in Greenbrier County and Virginia pine in Summers County.

The white pine sawfly, Neodiprion pinetum, found feeding on Virginia pine in Summers County at Pipestem State Park.

The following insects were submitted to the lab during the 1976 season. Even though important, these insects were not occurring in numbers large enough to cause concern.

The green striped maple worm, Anisota rubicunda, found on maple in Harrison County.

The mimosa webworm caused moderate damage to Mimosa and Honey Locust in Kanawha Valley.

Mites were very numerous this year and were found causing damage to Norway spruce, hemlock and boxwood.

The larger elm leaf beetle, Monocesta coryli, found to be causing damage to elms throughout the state. The insect seemed to be more prevalent in the eastern panhandle.

The elm leaf beetle, Pyrrhalta lateola, caused heavy damage to elms in Kanawha County.

The walnut caterpillar, Datana integerrima, was found on walnut in Kanawha County.

Hickory tussock moth, Halisidota caryae, was submitted from Wayne and Kanawha counties.

Hickory horn devil, Citheronia regalis, was found on apple in Clay County.

Orange-striped oakworm, Anisota senatoria, found causing moderate damage to Chinese chestnuts in Nicholas County.

The red-humped oak worm, Symmerista albicosta, collected from oak.

Numerous specimens of the boxelder bug, Leptocoris trivittatus, were submitted from the Kanawha Valley.

Nantucket pine tip moth, Rhyacionia frustrana, caused considerable damage to Scotch pine at Lakin Nursery and Scotch pine plantations throughout West Virginia.

## PATHOLOGY SECTION

### DISEASE REPORTS

#### Dutch Elm Disease - Ceratocystis ulmi

Dutch elm disease incidence appears to be on the rise in West Virginia. Unless urban areas in the state initiate control procedures, we can expect many cities to lose the American elm to this disease.

Attempts have been made to contact some of the states largest cities to determine any interest in a Dutch elm disease control program. We anticipate federal assistance for cities that do initiate such a program.

#### Verticillium Wilt - Verticillium albo-atrum

Each year we lose numerous ornamental trees and shrubs to verticillium wilt. The disease is more severe on maple. However, numerous other trees and shrubs are susceptible.

#### White Pine Root Decline - Verticicladiella procera

White pine root decline has been a severe problem in certain Christmas tree plantations. No controls have yet been found for this disease.

Armillaria Root Rot - Armillaria mellea

This disease caused extensive damage to trees in several woodlots in Kanawha County. The landowners had suspected that herbicides had been misused. However, closer examination revealed the rizomorphs from Armillaria mellea at the ground line around the dead and dying trees. The trees that were attacked appeared to have been in a state of decline for several years.

Black Knot of Cherry - Dibotryon morbosum

Little work was conducted on black knot of cherry in 1976. Hopefully a joint survey with Dr. W. L. MacDonald from West Virginia University will be completed early in 1977. Possibly we can then answer some of the management problems in cherry stands caused by this disease.

Cytospora Canker - Cytospora kunzei

Norway spruce exhibiting cytospora cankers have been observed scattered around the state. However, only minor losses have occurred as a result of this disease.

Western Gall Rust - Peridermium harknessii

Heavily galled Scot's pine have been noted in Pocahontas, Tucker, Mercer, Morgan and Grant counties. The number of galls observed in each of the stands indicates that we are dealing with western gall rust.

Unlike other rust diseases, western gall rust does not need an alternate host. Therefore this disease could cause extensive damage in our Christmas tree plantations.

In the Spring of 1977 we plan to take some actively sporulating gall specimens to positively identify the causal organism.

Diplodia Tip Blight - Diplodia pinea

Diplodia tip blight of Scotch, red and Austrian pine has been observed throughout the state. Generally the disease is limited to only one or two trees at any one location. However, extensive damage was noted in two, six acre plantations of Scotch pine in Raleigh and Mercer counties.

Lophodermium Needlecast - Lophodermium pinastri

Lophodermium needlecast may be found in Scotch pine plantations throughout the state. This disease was not as severe as it had been in past years. Apparently climatic factors during the Fall of 1975 and Spring of 1976 were not conducive to disease development.

#### Swiss Needlecast - Phaeocryptopus gaumanni

Swiss needlecast disease occurs in all of the Douglas fir plantations in the state. However to date losses from this disease have been light. Severe infections were reported in only three plantations in the state.

#### Anthracnose of Hardwoods - Gnomonia sp., Guignardia sp., Gloesporium sp. and others

Numerous requests for assistance were received in the pest identification laboratory concerning anthracnose of hardwoods. Most requests centered around the heavy defoliation of hickory and buckeye trees. Fortunately, the defoliation occurred late in the growing season so little if any damage to these trees should result.

#### Herbicide Mis-application

A common problem submitted to the Pest Identification Laboratory is herbicide damage to woody plants. Apparently many homes and landowners fail to read the instructions and precautions on the pesticide label. Hopefully, with the advent of the new pesticide regulations, there will be a reduction in pesticide misuse problems.

#### American Chestnut - Chestnut Blight - Endothia parasitica

Work on the American chestnut program progresses very well in 1976 under the guidance of Bruce Given. At least 40 mature chestnut trees displaying blight resistance have now been located. Nut collections from these resistant trees were very fruitful. All the collected nuts have been stratified and will be planted at the State Nursery at Lakin.

Bruce has met with some success in grafting. However, we still have problems with incompatibility between Chinese root stock and some of the American chestnut scion. We plan to obtain Japanese chestnut and chinquapin root stock to see if we can overcome the incompatibility problem.

### THE OAK WILT DETECTION AND CONTROL PROGRAM

The 1976 program began June and ended October. A total of 1668 diseased trees were located and treated in 1048 infection centers. This compares with 1748 diseased trees in 1198 centers in 1975. The 1976 totals include 647 diseased trees located in 335 previously treated centers (breakovers) and 1021 trees in 719 centers located for the first time.



The infection centers were located in 28 of our state's counties. The red (black) oak group comprised 98.7% of the treated trees. While only 1.3% of the treated trees were of the white oak group.

A total of 2021 man-days were worked by the ground crews and 1864 hours and 35 minutes were flown on aerial survey.

#### OAK WILT RESEARCH

The latest research efforts by Dr. W. L. MacDonald have centered around biological control of the oak wilt fungus. Three fungi Schizophyllum commune, Trichoderma viride and Gliocladium caseum were injected into oak wilt diseased trees. The oaks were later sampled and specimens cultured to determine if the three fungi did inhibit the oak wilt fungus.

The United States Forest Service ended their pressure injection study which began in 1973 under the direction of Charles Rexrode. In this study Cacodylic Acid was injected into the diseased oaks.

The system and results have shown some promise. Therefore the state plans to continue the injections on the two research quadrangles where the previous work was done.

#### WHITE PINE BLISTER RUST

##### White Pine Blister Rust - Cronartium ribicola

White pine blister rust control records indicate for the year 1976, 15,181 gooseberry and currant plants were destroyed on 1,325 acres requiring suppression activities.

In addition to direct control activities, 35,915 acres were surveyed in pre-suppression activities and pine area evaluation were made on 1,500 acres.

A total of 9,438 acres of the control area was placed in a "No Further Work" category due to ribes and pine conditions. This brings the total acreage on State and Private Land in West Virginia that will need "No Further Work" to 217,961 from a total control area of 413,195 acres.